

Nurses' Perception of Risk Factors of Phlebitis Associated with Peripheral Intravenous Catheter: A Cross-Sectional Study

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ABSTRACT

Background: Phlebitis is a main complication of peripheral intravenous catheters. Nurses play an important role in identifying the risk factors of phlebitis in order to reduce the incidence of phlebitis. The purpose of this study is to determine nurses' perceptions of the risk factors for phlebitis.

Methods: This cross-sectional study was conducted in Hospital Tengku Ampuan Afzan and a random sample of hospital nurses was recruited. 269 participants were involved in this study. All participants are required to answer the questionnaire which divided into two sections, section A regarding socio-demographic background and section B about perception on the risk factors of phlebitis that consist of ten multiple choice questions.

Results: The results showed majority of nurses, 75.8% (204), agreed that phlebitis is a significant problem, while 23.0% (62) thought phlebitis is a moderate problem, and only 1.1% (3) of nurses agreed that phlebitis is a minor problem. Nurses recognized some risk factors for phlebitis; however, more than half of the nurses were unaware that cannula material, size of the cannula, and the characteristics of fluid and drug can affect the development of phlebitis.

Conclusion: The study showed that nurses did not fully perceive the risk factors of phlebitis. However, they were knowledgeable about certain risk factors such as the duration for cannula replacement and the insertion site of the cannula. These findings indicate ongoing training for nurses in peripheral intravenous catheter (PIVC) management and education about the risk factors of phlebitis are necessary.

Keywords: Phlebitis; Perception; Peripheral intravenous catheter; Risk factor; Nurse

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INTRODUCTION

Most patients admitted to hospitals typically need at least one peripheral intravenous catheter (PIVC) to administer intravenous fluids, medications, or for blood sampling (1). However, the indications for venous access must be carefully considered to mitigate the risk of complications. Among these complications, phlebitis stands out as one of the most common, as highlighted in research by Mandal and Raghu (2). Phlebitis, an inflammatory condition affecting the vein, can lead to patient discomfort and necessitate premature catheter removal, posing challenges to patient care and management (3). Risk factors for phlebitis include catheter material, location of the inserted catheter, duration of catheterization, pH, and osmolality of the infused fluid.

For nurses, their perception of phlebitis and its risk factors is important as these may influence the incidence of phlebitis and the complications that arise from it. As claimed by Milutinović and Simin (4), some nurses perceive factors that may reduce the incidence of phlebitis, but more than half of nurses do not. Furthermore, nurses' knowledge and early recognition of risk factors for the development of phlebitis can reduce complications (4). According to Li, Liu, and Qin (5), 47.5% of nurses believe that phlebitis is a significant problem, 51.1% consider it a moderate problem, and the rest view it as a minor problem. Meanwhile, a study by Milutinović and Simin (4) shows that most nurses perceive phlebitis as a significant problem rather than a moderate or minor one (4). These two studies indicate that nurses perceive phlebitis as a significant problem.

Furthermore, work experience influences nurses' perception of the risk factors of phlebitis. According to Milutinović and Simin (4), there was a significant difference between nurses' perception and the site of catheterization. Nurses with six to ten years of working experience made better choices regarding vein selection (4). This statement is supported by Li et al. (5), which found a significant difference in nurses' perception of the appropriate insertion site for an intravenous cannula to reduce the incidence of phlebitis. It is important to consider perception in certain conditions because perception shapes how individuals think about and understand various aspects. Therefore, this study aims to explore nurses' perceptions regarding the risk factors associated with phlebitis related to PIVC. Understanding nurses' perspectives on these risk factors is crucial for implementing effective

prevention strategies. By identifying and addressing misconceptions or gaps in perception, this research seeks to enhance patient care and outcomes associated with intravenous therapy in clinical settings.

METHODS

Study Design

A cross-sectional study was conducted using random sampling to select the participants and utilized a self-administered questionnaire to assess the perception of risk factors of phlebitis associated with PIVC.

Study Population and Setting

This study was conducted in one of the public hospitals located on the East Coast of Malaysia. The study included participants who are nurses working in the medical, surgical, orthopedic, obstetrics & gynecology, ophthalmology, and pediatric wards. A random sampling method was utilized among participants who met the inclusion and exclusion criteria in this study. The sample size was calculated using the Raosoft sample size calculator, considering that not all 891 nurses were available during the study. After calculation, the suggested sample size for this study was 269 respondents. To account for potential dropouts and missing data, 10% of the calculated sample size was added, resulting in a new sample size of 296. The questionnaire adopted from Li, Liu and Qin (5) was administered voluntarily by the participants. A set of questionnaires was given to participants face-to-face. Participants who had signed the informed consent and agreed to participate in the study completed the questionnaire. Completion of the questionnaire took approximately 15–20 minutes. The questionnaire consisted of two sections. The first section gathered socio-demographic data (gender, age, education level, and years of work experience). The second section consisted of 10 questions related to the risk factors of phlebitis, with several answer options for each question.

Data Analysis

The data was analyzed using SPSS version 24 (IBM Corporation, New York, USA). Categorical data were presented as frequencies and percentages to describe sociodemographic data and nurses' perception of the risk factors of phlebitis.

RESULTS

Sociodemographic Characteristics

A total of 269 participants were included in the study **Table 1**. They were all female nurses, accounting for 100% of the sample. The majority of participants fell into the age group of 30 to 40 years old, comprising about 48.7% (n=131), while

40.9% (n=110) were nurses younger than 30 years old. Approximately 97.8% (n=263) of the nurses held a diploma as their qualification, while only 2.2% (n=6) held a bachelor's degree. The majority of nurses (36.4%) had 6-10 years of experience, followed by 34.6% with less than 6 years of experience, and 29.0% with more than 10 years of experience.

Table 1: Sociodemographic data of participants (N=269)

Variables	Category	Frequency	Percentage (%)
Age	<30	110	40.9
	30-40	131	48.7
	>40	28	10.4
Gender	Male	0	0
	Female	269	100
Level of education	Diploma	263	97.8
	Degree	6	2.2
Working experience	≤ 5 years	93	34.6
	6 – 10 years	98	36.4
	≥ 11 years	78	29.0

Perception of Risk Factors of Phlebitis

The results of the survey related to the perception of risk factors of phlebitis **Table 2** showed that a majority of nurses, 75.8% (n=204), agreed that phlebitis is a significant problem, while 23.0% (n=62) thought phlebitis is a moderate problem, and only 1.1% (n=3) of nurses agreed that phlebitis is a minor problem. Regarding the material of the catheter that can influence the development of phlebitis, the majority of nurses, 85.5% (n=230), chose 'I don't know' as their answer, indicating that nurses lack adequate knowledge about this risk factor. Most nurses, 49.8% (n=134), believed that a peripheral intravenous catheter should be replaced after 72 hours to reduce the risk of phlebitis. Based on this result, it shows that nurses perceive this risk factor well. However, more than half of the participants, 58.7% (n=158), believed that a large-size catheter can help reduce the risk of phlebitis. This finding indicates that participants do not perceive the size of the cannula as contributing to the development of phlebitis. Additionally, more than half of the participants, 60.6% (n=163), answered that the hand is the best site to insert a catheter to reduce the risk of phlebitis. A high percentage of nurses, 87.0% (n=234), chose 'high concentration' as the answer to the question about characteristics of fluids and drugs that influence the incidence of phlebitis.

The majority of participants, accounting for 75.8%

(n=204), perceived phlebitis as a significant problem, highlighting the widespread concern within the nursing community. When asked about which catheter material reduces the risk for phlebitis, a notable 49.8% (n=134) admitted to being uncertain, indicating a potential gap in knowledge that warrants further attention and education. Similarly, an equal proportion of participants, also at 49.8% (n=134), suggested replacing PIVC every 72 hours, emphasizing the importance of adherence to established protocols in mitigating phlebitis risk. In terms of expertise influencing perceptions, a considerable 36.4% (n=98) of participants with 6-10 years of experience believed that skilled vein puncture could decrease the risk for phlebitis, suggesting that clinical experience may play a role in shaping perceptions of preventative measures. Notably, an overwhelming 92.6% (n=249) of participants believed that routines for documenting the insertion of PIVC could decrease the risk for phlebitis, underscoring the significance of systematic approaches in ensuring patient safety.

When it comes to the impact of dressing on phlebitis risk, a significant 45% (n=121) of participants acknowledged its potential influence, indicating the need for further exploration into dressing practices and their implications for patient outcomes. Furthermore, participants widely recognized high concentration as a factor increasing the risk for phlebitis, with 87% (n=234) of participants expressing this concern. This

highlights the importance of considering fluid and drug factors in catheter-related complications. Regarding catheter qualities, a notable 58.7% (n=158) believed that using a large-size catheter could decrease the risk for phlebitis, contradicting the practice recommendation to use the smallest size to reduce phlebitis. In terms of site selection, a significant majority of 60.6% (n=163) perceived that the hand was the site that decreases the risk for phlebitis, indicating a strong consensus among participants. Conversely, 37.2% (n=100) identified the wrist as a site that increases the risk for phlebitis, emphasizing the importance of site selection in minimizing complications during catheter insertion.

DISCUSSION

Catheter Material

The material of the cannula influences the development of phlebitis, as mentioned in some studies. This statement is supported by a study (6) that suggests Vialon catheters are less likely to cause phlebitis than Teflon catheters. The authors reported that PIVCs were removed due to phlebitis development in 16.3% of the Vialon biomaterial catheter group and 53.8% of the Teflon catheter group. However, in this current study, almost all participants (85.5%, n=230) indicated that they were not knowledgeable about it. This misconception might be due to a lack of information or knowledge regarding the materials of the PIVC that can cause phlebitis.

Catheter Replacement

Centers for Disease Control guidelines recommend replacement of PIVC no more frequently than every 72 to 96 hours. Routine replacement is thought to reduce the risk of phlebitis and bloodstream infection. This study finding showed that the participants have adhered to the recommendations, as the majority of participants (49.8%, n=134) agreed that catheters should be replaced to prevent inflammation of the vein. Thus, participants perceived well the risk factor of phlebitis related to the time replacement of the catheter.

Catheter Size

The incidence of phlebitis was lower in patients with 20-gauge cannulae compared to those with

18-gauge sizes (2). Furthermore, the benefits of utilizing smaller gauge catheters include their ability to facilitate blood flow into surrounding tissue, thereby reducing the risk of vein damage (7). However, the results of this present study contradict established knowledge, as the majority of nurses (58.7%, n=158) identified 'large size catheter' as capable of reducing the risk of phlebitis, while only 23.8% (n=64) selected 'small size catheter.' This discrepancy may stem from their personal logic, with the belief that a larger catheter facilitates fluid movement through the vein more effectively, leading to reduced inflammation.

Insertion Site

The current guidelines recommend utilizing the upper extremities for PIVC insertion. According to the updated CDC guideline, there is a higher risk for phlebitis if the catheter insertion is done in the forearm or antecubital fossa compared to the hand or wrist (7). In this study, 60.6% (n=163) of nurses preferred the hand as the best site to insert the catheter, as this site can reduce the risk of phlebitis. This finding demonstrates that nurses' perception of the preferred site for catheter insertion to reduce the risk of phlebitis aligns with current knowledge.

Fluid and Drugs

It is well-known that both high and low pH and osmolarity of a fluid or drug can increase the risk of phlebitis (8). This statement is supported by Simões et al. (9) study which found that low pH and high osmolarity of solutions, such as hypertonic solutions, increase the risk of phlebitis. However, in this study, only 4.5% of nurses were aware that high pH can increase the risk of phlebitis, and only 1.1% of nurses knew that low pH can have the same effect. Similarly, for high osmolarity, only 3.7% of nurses were aware of its impact, while another 1.5% recognized that low osmolarity can increase the risk. The majority of nurses (87%) identified high concentration as increasing the risk of phlebitis. The low percentage of nurses providing correct answers in this study indicates that they are not up to date with current knowledge regarding the influence of fluid and drug characteristics on the development of phlebitis.

Table 2: Perception of risk factors of phlebitis

Category	Frequency (n)	Percentage (%)
Though on incidence of phlebitis		
A large problem	204	75.8
A medium problem	62	23
A small problem	3	1.1
Catheter material influences the risk of phlebitis		
Teflon	29	10.7
Vialon	10	3.7
I don't know	230	85.5
Duration for replacement of PIVC		
24 hours	4	1.5
48 hours	13	4.8
72 hours	134	49.8
When clinically indication is appear	118	43.9
Skilled vein puncture can decreases the risk for phlebitis or not		
Yes	241	79.6
No	44	16.4
I don't know	11	4.1
Documentation of inserting PIVC can decrease the risk of phlebitis or not		
Yes	249	92.6
No	10	3.7
I don't know	10	3.7
Effect of dressing toward phlebitis		
Yes	121	45
No	121	45
I don't know	27	10
Fluid and drug factors influence the risk of phlebitis		
High pH	12	4.5
Low pH	3	1.1
High concentration	234	87.0
Low concentration	5	1.9
High osmolarity	10	3.7
Low osmolarity	5	1.6
Qualities of the PIVC		
Small size catheter	64	23.8
Large size catheter	158	58.7
I don't know	47	17.5
Sites of catheter insertion decrease the risk of phlebitis		
Hand	163	60.6
Wrist	30	11.2
Forearm	39	14.5
Foot	20	7.4
Antecubital fossa	17	6.3
Sites of catheter insertion increase the risk for phlebitis		
Hand	21	7.8
Wrist	100	37.2
Forearm	34	12.6
Foot	40	14.9
Antecubital fossa	74	27.5

CONCLUSION

The study showed that nurses did not fully perceive the risk factors of phlebitis. However, they were knowledgeable about certain risk factors such as the duration for cannula replacement and the insertion site of the cannula. These findings indicate ongoing training for nurses in peripheral intravenous catheter (PIVC) management and education about the risk factors of phlebitis are necessary. Therefore, improvement in nurses' knowledge regarding the risk factors of phlebitis will heightened awareness that can lead to better decision-making, a more attentive and responsive approach to patient care, ultimately resulting improvement of post-insertion management of PIVC. Moreover, further study needs to be carried out for developing more effective strategies of monitoring and maintaining PIVC ultimately benefiting patient care and healthcare outcomes.

CONFLICT OF INTEREST

The authors declare there is no conflict of interest.

ETHICAL MATTERS

Ethical clearance and approval were obtained from the Kuliyah (Faculty) of Nursing (IIUM) [Reference No: IIUM/G?313/20/4/10] and Medical Research and Ethics Committee of the Ministry of Health Malaysia [Reference No: (5)KKM/NIHSEC/P17-492 at the commencement of the study.

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AUTHOR CONTRIBUTIONS

NIMZ: drafted the manuscript and contributes to the concept development and design of the article through data collection, analysis and data interpretation for the article.

AD: revised the manuscript critically with intellectual contents and approved the final version of the manuscript.

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